

888-8

888-8.

Surfacing Concrete
with
CON-TEX

CONCRETE SURFACE CORPORATION
342 Madison Avenue
New York City

Handbook
of
Concrete
Finishing



“ * * the substance of things hoped for—
the evidence of things unseen.”*

*Bridge at U. S. Naval Training Station, Great Lakes, Ill.
Department of Yards and Docks
United States Navy.*

Copyright 1926. All rights reserved.
Printed in U. S. A.

STUTTGART, ILLINOIS
AMERICAN

10 88-29694 725

"Con-TEX"—the surfacing for Concrete

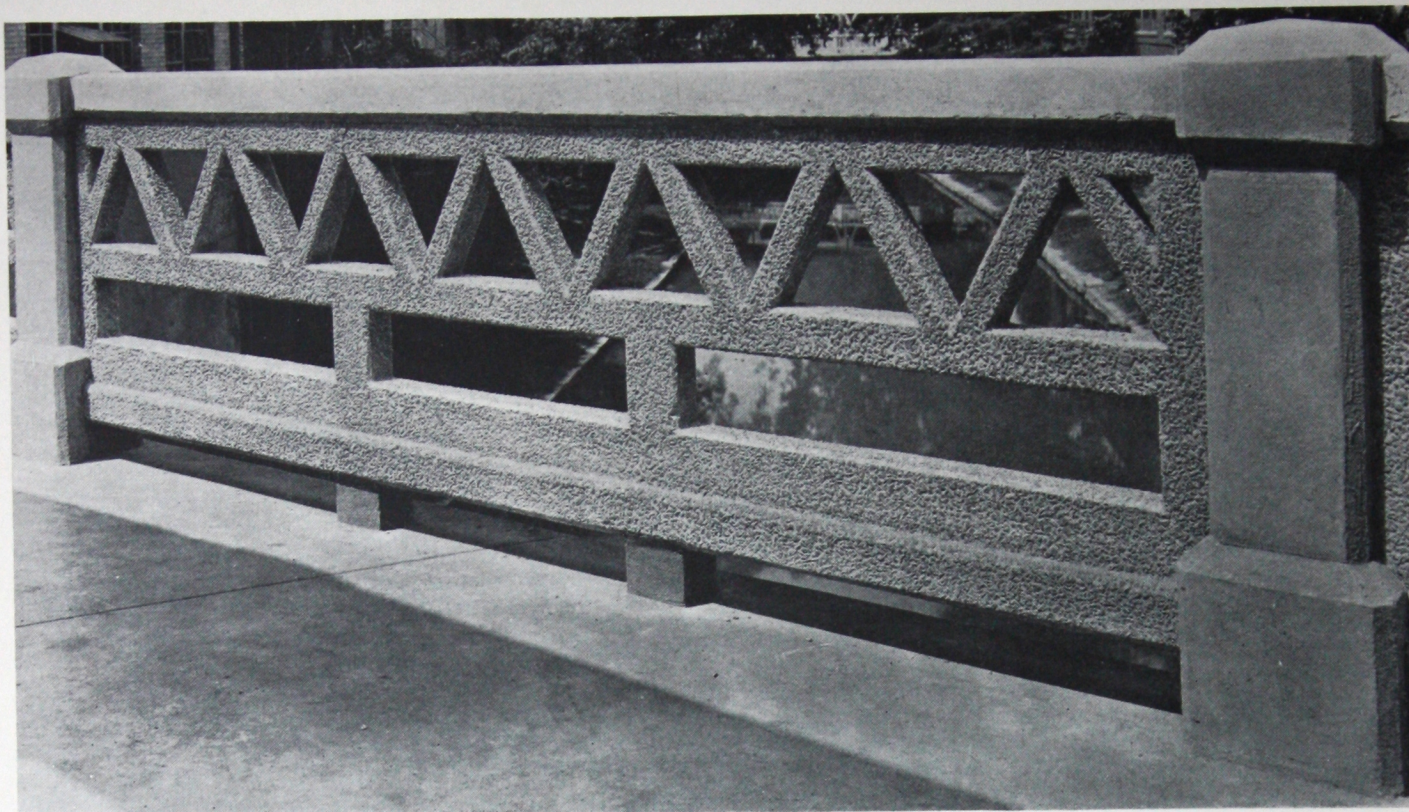
CON-TEX is a trade name that stands for a notable development and advance in the concrete art—an advance that means a new era in construction.

CON-TEX is a liquid material, not acid and not harmful, that safely, effectively and cheaply surfaces concrete by controlled chemical processes and means.

The method of using CON-TEX and the kind of CON-TEX used for any given purpose or class of construction is explained in full in the following pages.

CON-TEX and the CON-TEX processes of surfacing concrete were originated and developed by Nathan C. Johnson of Hool and Johnson, Engineers, of New York City. These processes and their values, both direct and indirect, are explained in detail in the "Discussion" by Mr. Johnson, on pages 22 to 26 of this brochure.

"CON-TEX" and all the name has come to stand for through successful commercial use are exclusive with the Concrete Surface Corporation of 342 Madison Avenue, New York, as sole licensee under the Product and Process Patent Rights of Mr. Johnson.



Note the clean arrises and even texture on the concrete balustrades of the Presa Street Bridge, San Antonio, Texas. Terrell Bartlett Engineers, Inc., Designers; McKenzie Construction Company, Builders.

The kinds of Con-Tex and their uses

There is a *kind* of CON-TEX suited to every concrete surfacing need. The kinds of CON-TEX are:

(1) Standard Con-Tex

STANDARD CON-TEX produces on form-cast concrete a finished surface of exposed aggregates. By the use of STANDARD CON-TEX the unsightly appearance of concrete is done away with. Texture and color, with freedom from blemishes, such as the grain of form boards, are obtained at one operation.

(2) Bonding Con-Tex

BONDING CON-TEX produces on concrete a rough surface of clean stone and clean sand to which plaster, or stucco, or new concrete will unfailingly and enduringly bond. By its use, concrete becomes monolithic in the true sense. Plaster, stucco, tile, etc., never separate from a CON-TEX exposed Bond Surface.

(3) Stucco Con-Tex

STUCCO CON-TEX produces color and texture, permanence and freedom from cracking in stuccos by taking off the outer film of cement.

(4) Special Con-Tex

SPECIAL CON-TEX suited to any character of work desired, is manufactured to order for special uses such as revealed aggregate surfacing of roadways, plaza areas, pavements, floors, etc., and other uses in great variety.

Standard Con-Tex for producing finished surfaces on form-cast concrete

STANDARD CON-TEX is used for finished-surface work on form-cast concrete.

Finish of some kind at exposed surfaces is a necessity for all form-cast concrete. The problem of producing a satisfactory surface finish at low cost has existed since the first concrete was made.

Numberless attempts to produce such a finish have been made throughout the Concrete Art.

Washes and plasters as a finish over concrete leave much to be desired. Such applied finishes stain and discolor; and from the action of natural forces, they scale off wholly or in spots in a short period of time.

Carborundum rub finish is difficult of execution if thoroughly done and is correspondingly expensive.

Tooling is laborious and expensive. Tooling also crushes the ballast, thereby destroying the natural beauty that properly belongs to concrete. Crushed ballast loses color and character and becomes dull white, like powdered glass.

A STANDARD CON-TEX finish, on the contrary, leaves the aggregates clean, colorful and unbroken. And to the beauty of color is also added the beauty of texture and of light and of shade.

STANDARD CON-TEX coated on forms produces on concrete cast in these forms, effects heavy or light, as desired, and ranging from the finest of reveals to the rugged surfaces heretofore obtained only by point tooling.

A CON-TEX finished surface, has, therefore, superiority in every way, including superiority of endurance to the weather, inasmuch as the high percentage of stone presented to the elements and the low percentage of absorptive mortar remaining between the exposed stone makes for high permanence and endurance.

How Standard Con-Tex is used to surface concrete

There are two operations in producing finished surfaces on cast concrete with STANDARD CON-TEX.

These are:

- (1) Applying STANDARD CON-TEX to the forms with an ordinary brush.
- (2) Washing off or brushing down the concrete surface after the forms are removed.

STANDARD CON-TEX is not a thick paste, but a free-flowing, quick drying liquid that is easy to apply. It goes on with a wide brush, just as any full bodied varnish is applied on wood, or metal. The proper thickness of STANDARD CON-TEX coating on the forms is the same as any flow-coat of varnish.

How Con-Tex acts

STANDARD CON-TEX, as a coating on forms, alters the character of the usual surface skin, or form skin of concrete, while the concrete is plastic.

When concrete is placed in forms, the outer surfaces become over-rich in cement, because cement is the heaviest material in the mixture, as well as the finest material in size.

This cement at these surfaces lies next to and in contact with the coating of STANDARD CON-TEX on the forms. A definite series of slow and controlled actions is then set up, which forces these outer layers of cement that make the usual form skin, to remain permanently unset and *to any depth desired*. These slow, controlled and definite actions collectively make up the CON-TEX Process of Surfacing Concrete.

When the forms are removed, much of this unset material comes away with the forms. The remainder is brushed off or washed off the concrete. A Finished Surface of clean aggregates results; and these aggregates are firmly held in the concrete below the line to which CON-TEX acted.

Con-Tex control and the Con-Tex action

The depth of the non-setting action of STANDARD CON-TEX is dependent upon the "grade" or strength used and not upon the thickness of the CON-TEX coat.

There are five "grades" or strengths of STANDARD CON-TEX. Each "grade" of STANDARD CON-TEX may be depended upon to act only to its proper depth *and no further*.

The "control" of depth of action of each grade of STANDARD CON-TEX is rigid and accurate. The results are definite and sure with any concrete in which the distribution of cement and aggregates are uniform.

STANDARD CON-TEX has no continuing action on concrete. It is completely exhausted with each use and there is no hang-over, either in



By removing the surface film of cement, both color and texture have been given this wall and these corner posts at Meridian Hill Park, Washington, D. C. Arthur H. Tompkins and Company were the contractors.

the concrete, or in the hard varnish film remaining on the forms.

When thus exhausted by use, the coat of CON-TEX turns from its characteristic red color to white, so that its active or exhausted condition is readily seen at a glance. And this varnish film protects the forms against the lime waters of concrete that so often destroy them by making them brittle, as though dry-rotted.

STANDARD CON-TEX should always be used for finished-surface work on Form-cast Concrete. Rigid control of the non-setting actions outlined above are embodied in STANDARD CON-TEX; and this rigid control is necessary for success.

Grades or strengths of Standard Con-TEX for finished surfaces on cast concrete

There are five "Grades" of STANDARD CON-TEX known as A, B, C, D, and E.

Each is suited to give a definite "reveal" or depth of action, by rendering a definite portion of the surface cement non-setting.

Based on the cement content of a usual 1:2:4 mix, the following table may be referred to in specifying and in ordering STANDARD CON-TEX.

For Fine-Surface molds of metal, plaster or wood:

Grade A gives about $\frac{1}{16}$ inch reveal—used only for grits and like size.

Grade B gives about $\frac{3}{32}$ inch reveal—used with grits to $\frac{1}{4}$ inch in size.

For wood forms or metal forms in field use:

Grade C gives about $\frac{3}{16}$ inch reveal—used with ballast $\frac{3}{8}$ inch to $\frac{3}{4}$ inch in size.

Grade D gives about $\frac{5}{16}$ inch reveal—used with ballast $\frac{1}{2}$ inch to $1\frac{1}{2}$ inch in size.

Grade E gives about $\frac{1}{2}$ inch reveal—used with ballast $\frac{3}{4}$ inch and larger stone.

Cost of finished surfaces with Con-TEX

The following comparison of costs for old methods of surface finishing as compared to a CON-TEX surface has been compiled from reliable data:

Point-Tooling-power	34¢ sq. ft.
Bush Hammering-power.....	12-27¢ sq. ft.
Bush Hammering-hand.....	15-37¢ sq. ft.
Carborundum rub	10-17¢ sq. ft.
Wash and float-hand.....	6-9¢ sq. ft.
CON-TEX SURFACING	2½-6¢ sq. ft.

All of the foregoing costs are for labor and materials inclusive.

Labor in applying STANDARD CON-TEX to forms plus brushing off the concrete surface after removing forms, costs less than 1¢ sq. ft. as an average. Forms are broomed off as usual, or washed off with a hose.

The spread of STANDARD CON-TEX averages 175-200 sq. ft. per gallon, assuming three uses

of forms. For one use of wood forms, the spread is about 140 sq. ft. per gallon, as two coats are required on first use, and one coat on each re-use. The first coat is a priming coat. *No other primer than Con-Tex may be used.*

The cost of STANDARD CON-TEX itself depends on the total area contracted for. Quantity quotations on estimated areas promptly furnished on request. All grades of STANDARD CON-TEX are priced alike.

Standard Con-Tex and architectural effect

STANDARD CON-TEX lends itself to architectural effect with most pleasing results. With STANDARD CON-TEX, concrete becomes available for thousands of uses that have been heretofore barred to it because of its customary appearance.

Line and form, even at arrisses, are preserved by CON-TEX when forms are carefully built and the concrete work carefully done. Texture is automatically added as a part of the CON-TEX process; and contrasts in texture are readily obtained by the use of different grades of CON-TEX on adjacent portions.

As a suggestion, Grade C STANDARD CON-TEX will give a light reveal on borders while Grade D or Grade E STANDARD CON-TEX will give a deeper reveal in panels. This gives the effect of depressed panels on a plane surface. Borders may also receive a rubbed finish, if desired.

In our experience, unbroken areas of large size are undesirable in any finish or any material. We therefore advocate breaking areas by panelling.

Panelling and other effects are readily obtained by tacking a beveled or half-round nosing to the forms to outline the desired areas. This gives sharp arrisses and also, by a heavy border shadow, intensifies the architectural lines.

Also see section on Composite Construction for Fine Architectural Effects. (Page 16).

Standard Con-Tex in retaining wall work

Retaining walls of concrete are one of the most prominent features of our modern landscape by reason of their extensive employment in railroad and highway work.

By the use of STANDARD CON-TEX on the forms and particularly with panelling, artistic and permanent surfaces are secured which make retaining walls and like structures distinct architectural additions.

Standard Con-Tex in bridge work

Bridges both large and small derive distinct benefits from the use of STANDARD CON-TEX, as in piers, arches and spandrels.

STANDARD CON-TEX is also used effectively in balustrades, copings and cornice work.

Bridge approaches are also advantaged by this treatment; and a permanent enduring effect of great beauty is obtained.

Panelling, as above described, is of architectural assistance in all work of this character.

Construction joints in bridges, exposed for bond by coating bulkheads with BONDING CON-TEX, unite old and new concrete in a perfect union, through which no leaching, or like disfiguring actions can take place.

Standard Con-Tex for finished cornice work

By the use of metal cornice forms of standard or special patterns, coated with STANDARD CON-TEX, very beautiful cornices and belt courses can be easily secured in any concrete work.

These uses are too obvious to need explanation, and the procedures follow the ordinary routine.

Standard Con-Tex for finished ceiling work

Ceiling surfaces, revealed by CON-TEX, may be made sufficiently fine to serve without plastering. They may also be plastered at any time, either when the structure has yielded returns or during the original construction period, as the revealed aggregate offers a true and effective bond for any plastic material.

In passenger tunnels at railroad stations and in like uses, a CON-TEX surface is both a finished surface for ceiling and for walls and a guarantee against disfigurement by vandals.

Page 10 BONDING CON-TEX and Page 19 on SPECIAL CON-TEX.

Standard Con-Tex for basements above grade of residences public buildings, etc.

By the use of STANDARD CON-TEX, concrete for basements above grade can be given an architectural finish and be made safe against disfigurement by vandals.

The usual procedures of CON-TEX operations are followed, except that it is well to choose carefully the size of stone and color of stone

desired and to follow closely our specifications for concrete and for its placement.

Where the stone obtainable is not of a size or character or color suited to the finished surface desired, surfaces of such basements walls may be exposed for bond and a finely finished surface of selected aggregates may be put on as is set forth in the section under Composite Construction. (Page 16.)

Composite Construction with BONDING CON-TEX and STUCCO CON-TEX is most useful in many constructions: and the section of this brochure covering Composite Construction should be carefully read.

Standard Con-Tex for pre-cast units

With STANDARD CON-TEX, facing stones in any size, windows and door sills, lintels, balustrades and other objects without number may be made on the job.

The procedure is easy—merely coating the forms with a proper grade of STANDARD CON-TEX, casting the units and washing them off when removed from the forms.

Fancy moldings are easily produced by using the inner side of standard metal cornice moldings as a form and coating these with STANDARD CON-TEX.

Face-down work of this character is exceedingly easy to do. Where desired, a facing material of selected aggregates and white cement, with a backing of cheaper materials poured integral may be used.

Color in Con-Tex work

Color tones in great variety can be had in exposed-surface concretes either by using aggregates which contrast agreeably with the color of set cement—a dull gray-green—or else by adding color to the concrete, so that the mortar will contrast with the color of the aggregates.

Browns, reds, whites, yellows and combinations of these colors in the ballast are very effective with the color of set cement. Blues, grays and other neutral colors do not contrast well, unless reds or yellows or like colors are added to the concrete during mixing, or unless White Portland Cement is used.

White Portland Cement gives exceptional contrasts with any aggregate.

Please note that CON-TEX *does not* color concrete. It simply reveals what is in the concrete. Color must either reside in the stone or sand or both, or else be added as a pigment to color the mortar.

Some things that Con-Tex will not do

CON-TEX is a remarkable product, but some things it will not do.

Please note that:

CON-TEX *will not* make a poor concrete job a good one. Every contractor wants to do good work. Provide for a good job in specifications; have the specifications enforced and give the contractor a chance. (See Specifications for Concrete, Page 21.)

CON-TEX *will not* turn small stones into larger stones or vice versa. Select stone or gravel for concrete of a size suited to the type of surface that is desired. The best and the strongest and finest appearing concrete is made with one-sized ballast, not with so-called “graded” ballast. It is well to remember that a good building stone is an even-grained stone; and that a brick building is “one sized ballast of selected color with a minimum of mortar.”

CON-TEX *will not* bring stone to the surface but exposes the stone that is at the surface. Provide for a maximum of stone *at* the surface by specifying our recommended procedures for placing concrete and seeing that these procedures are followed.

CON-TEX *will not* bring crooked forms into line, or eliminate the bulge of sprung forms. Have forms made smooth, true to line and substantial.

CON-TEX *will not* turn careless work into good work. “The good old way” of slap-dash and haphazard is a dangerous proceeding, whether CON-TEX is used or not. It has spoiled more than one costly structure, even though the structure did not and will not fall down.

But CON-TEX *will* make a well built concrete structure better than is possible without its use and give it values not to be bettered by any building material in use today.

And, for best results follow the Specifications for Concrete and the suggestions immediately following. They lessen costs and *get results*

Specifications for Standard Con-Tex

IT is best to always specify STANDARD CON-TEX by name. The following form is commonly used:

"All surfaces of Form-cast concrete, whether precast or cast in place, indicated on the plans or in the specifications, or otherwise designated to be surface finished, shall obtain this finished surface by the use of STANDARD CON-TEX as made and supplied by the Concrete Surface Corporation, 342 Madison Avenue, New York City.

"The grade of STANDARD CON-TEX used shall be suited to the reveal desired by the Architect and specified by him, or marked on the plans.

"The STANDARD CON-TEX shall be used and applied and the concrete shall be treated in strict accordance with the manufacturer's directions.

In public work where trade names are not permissible, the following form is commonly used:

"All cast-concrete surfaces indicated on the plans, or in the specifications, or otherwise designated shall be surface finished by the use of a liquid material painted on the forms before placing concrete, or on the concrete itself where so directed, to obtain a revealed aggregate surface.

"The material used to produce this surface finish shall be an approved liquid coating applied to the forms, or in top surface work, applied to the concrete, before it has set and this approved coating shall meet the following requirements: It shall be composed of a colloidal base carrying active materials which latter shall operate only after coming in contact with the alkaline fluids of the concrete. This coating liquid shall not contain free acid; shall not contain any ingredient that will injure the aggregate, the reinforcement or the forms; shall dry quickly, and after drying shall not be injured by rain, snow or freezing; and there shall be no after effects injurious to the concrete or to applied materials. All surfaces, or forms for surfaces that are specified to be textured concrete obtained by exposing aggregates, shall be given an even coat or coats of this liquid, taking care to completely cover all areas.

"Where such coating is applied to forms, after removal of forms, the loosened surface of the concrete shall be immediately removed with wire brushes or other effective and approved means, and the concrete then thoroughly washed with hose or scrubbed with bristle brushes.

"Where such coating is applied directly to concrete, the surface treated shall be thoroughly cleaned of the coating and of loosened material at about 24 hours after applying, so that clean aggregates shall be evenly exposed throughout the areas treated."

Bonding Con-Tex for producing clean stone bonding surfaces on concrete

BONDING CON-TEX is similar in nature, and properties, and action, to STANDARD CON-TEX. It exposes clean stone and clean sand surfaces on concrete by preventing the setting of the surface cement to a definite depth.

BONDING CON-TEX is cheaper than STANDARD CON-TEX. BONDING CON-TEX should not be used for delicate finished-surface work. It is used only to produce the rugged surfaces of clean stone and clean sand necessary for bonding purposes.

Grades of Bonding Con-Tex

There is only one "grade" or strength of BONDING CON-TEX. It may be applied either to forms or directly to the top surfaces of concrete.

The strength of BONDING CON-TEX is suited to obtain the best character of bonding surface on the average concrete. It gives no graduated reveals or delicate effects. Its object is strictly utilitarian and it has been designed to give the maximum of effective action at low cost.

Uses of Bonding Con-Tex

BONDING CON-TEX is used to produce revealed aggregate bonding surfaces wherever it is desired to attach any new material to set and hardened concrete.

An exposed aggregate surface of this character is a true bonding surface, for it is fact that *no plastic material will permanently bond to the skin of set and hardened cement, but all plastic materials will chemically and physically unite with clean sand and clean stone.*

Examples of the fields of use for BONDING CON-TEX are:

- Plaster Bond on Ceilings, soffits, beams, etc.
- Bonding new concrete to old by coating bulkheads before casting concrete and by coating top surfaces of lifts. This procedure does away with the usual difficulties experienced at construction joints in all classes of concrete construction.
- Bonding tile, brick, etc., to concrete structures.
- Bonding top floors to under floors.
- Bonding column heads to new column bases, as in building construction.
- Bonding horizontal lifts in any type of construction, to eliminate leakage or usual unsightly joints.
- Bonding any material to concrete in any class of construction.

Bonding Con-Tex in plaster bond work

BONDING CON-TEX in plaster bond work is applied to forms in a smear-coat on the forms

before casting concrete. Long-handled brushes are used. Only one coat is required, even on first use of forms.

BONDING CON-TEX dries soon after application, as it has a quick-drying, volatile solvent.

When dried on forms, BONDING CON-TEX may be walked over without damage and it is sufficiently impervious to weather to resist a reasonable exposure and remain fully effective.*

Concrete is cast as usual. A dry mix is not necessary. In fact, a slushy mix gives the best results with the lowest cost.

When forms are dropped, most of the loosened material comes away with them. The rest may be raked off, or brushed off, or washed off with a hose stream by men working from floors, or from scaffolds.

The result is an ideal surface for the application of plaster. Clean, exposed surfaces of aggregate, bedded firmly in the concrete slab, take plaster quickly and freely and with little of the usual upward pressure from the trowel.

The union of plaster with these surfaces is complete itself, but this value is added to by a mechanical clinch that avoids all chance or hazard of accident or failure.

Furthermore, CON-TEX saves plastering costs. Two-coat work and even one-coat work may be used on a CON-TEX Bond-surfaced ceiling with full certainty of result; and the plaster is applied more easily and faster than is possible with any other type or kind of plaster bonding.

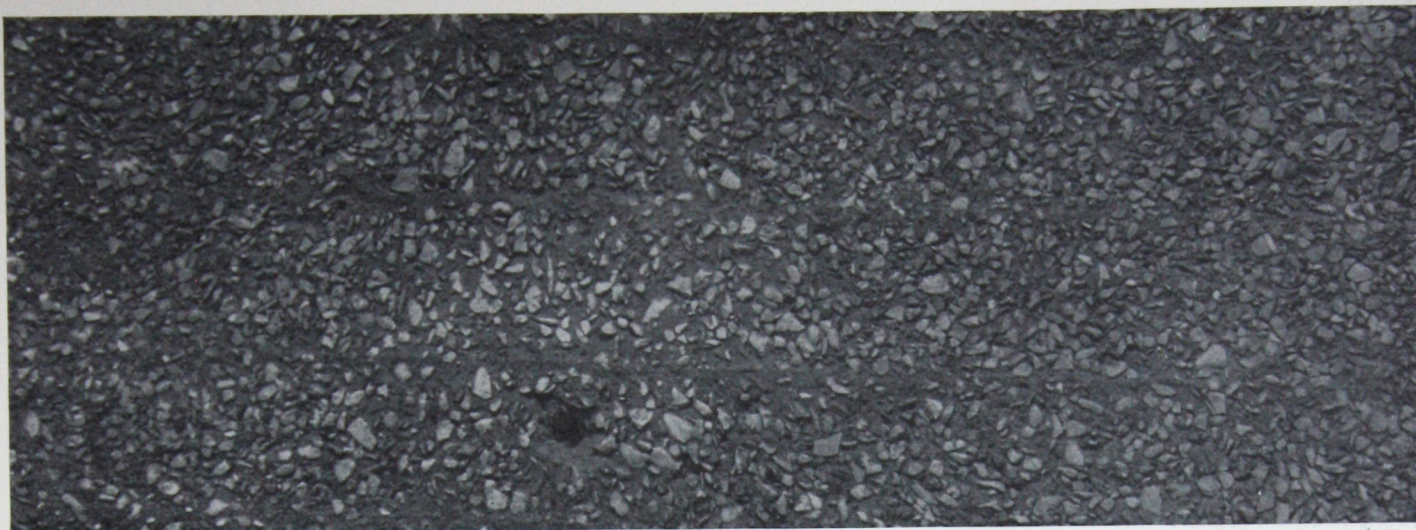
Bonding Con-Tex as insurance

Even aside from its other values, BONDING CON-TEX is a worth-while insurance against trouble and repairs. It is much cheaper and better to use CON-TEX and be sure than it is to take a chance.

Plaster *may not* fall from the usual more-or-less smooth concrete surface, yet it often does. But it never falls from a CON-TEX surfaced concrete, because the plaster then becomes an integral part of the concrete.

Again we say: "Nothing will permanently bond to set and hardened concrete, but all plastic materials will bond to clean sand and clean stone."

*Bonding Con-Tex is not quite as immune to weather as is Standard Con-Tex.



"Nothing will permanently bond to set and hardened concrete, but all plastic materials will bond to clean sand and clean stone."

Above is detail of concrete surface made ready by Bonding Con-Tex for plastering.

Bonding Con-Tex and tile bond and brick bond

A CON-TEX exposed surface of clean stone on any concrete surface will bond effectively and surely to the backing mortar of tile or brick work. And as the brick or tile bonds to this same mortar, the tie to the concrete is assured.

Metal ties are unnecessary, for good mortar can be relied upon to have a value in tension of at least one hundred pounds per square inch of surface—fourteen thousand four hundred pounds for each five bricks, or for each square foot.

The economy is evident and the result is certain.

Bonding Con-Tex and mortar finish work

A smooth, troweled finish is at times desired on certain classes of construction.

Usually, applied smooth finishes crack up and peel off, as they do not bond to the set concrete with reliable permanence.

But if the surface is CON-TEX bond-surfaced, the desired finish may be applied in a single coat, with full assurance of its "staying put."

Bonding Con-Tex and its use in bonding new concrete to set concrete

It used to be assumed that new concrete bonds to concrete that has set and hardened. It does not do so unless CON-TEX is used at construction joints to give a bonding surface.

BONDING CON-TEX painted on bulkheads be-

fore pouring any section exposes clean stone at these joints and makes a water-tight true bond between new and old concrete to the great advantage of any concrete structure that is built in sections.

Dams on which BONDING CON-TEX has been used at bulkheads do not leak at construction joints; and this water-tight condition remains permanent.

Reservoirs which are jointed in this manner remain so permanently and without the usual cost and trouble of slip joints and the like.

Some engineers now hold that it is better to omit slip joints and construction joints as these readily fill with dirt or other materials which prevent the closure of the joint after it has opened, and to substitute for such costly expansion joints a CON-TEX bonded joint, allowing the truly monolithic structure thus produced to take up within itself such strains as are induced by temperature.

Retaining walls, which often leak and stain at such construction joints, remain tight in like manner.

Swimming pools and structures of like character can not only be made monolithic and water-tight, but can be given a non-cracking and non-peeling interior coat, whether of tile or of stucco, by using BONDING CON-TEX on the forms for bond.

STANDARD CON-TEX can also be used to finish the top surfaces, such as curbs and walk ways. Gravel as ballast in concrete gives an agreeable and non-skid surface when exposed by CON-TEX.



Concrete surfaces prepared with Bonding Con-Tex form an inseparable bond with plaster making expensive furring unnecessary.

Bonding Con-Tex in bonding horizontal lifts in dams reservoirs and other structures

In many massive structures it is impossible to carry concrete to the full height between bulkheads in one continuous operation.

BONDING CON-TEX spread over the top of each lift in the manner described above and removed in the same manner when ready to go ahead with the next pour, secures an absolutely tight and permanent union between such concrete and the new concrete.

Joints of this character also do not permit seepage of water and further rid concrete of the laitance and other accumulated material which so often is a distinct detriment to the entire structure.

Although it is advantageous to cover the entire lift top with BONDING CON-TEX, in order to secure a full area of clean stone ready for bond with new concrete, it has been found sufficient in very large structures to CON-TEX two parallel bands, each two feet wide, lengthwise of the section under construction.

With these bonding areas on horizontal surfaces and exposed stone areas on bulkhead surfaces, the structures remain water-tight.

Bonding Con-Tex in top floor work

Floor slab sections may likewise be bonded together monolithically by coating the bulkhead at span centre with BONDING CON-TEX.

Top floors and under floors may also be made

truly integral, regardless of the interval between their placements, provided BONDING CON-TEX is used at the top surface of the underfloor, before it has hardened.

In applying BONDING CON-TEX to the tops of underfloors for these purposes, the CON-TEX is poured on in a pool or puddle and distributed with soft brushes, or with a rubber window-cleaning squeegee on a pole, until the surface is evenly covered throughout. The CON-TEX should be applied before final set has taken place.

In removing the BONDING CON-TEX and the loosened material in such top-surface work, iron garden rakes are used. The CON-TEX forms a tough skin over the concrete and when raked, rolls up, carrying much of the laitance and fine material with it. The remainder may be removed by brooms, or by hose stream.

The result is a surface of clean stone and clean sand that will bond effectively with the top floors, when this floor is laid at a later time.

Bonding Con-Tex in pavement sub-base work

Concrete sub-bases for pavements which are later to receive special surface coats may likewise be treated for bond, in the manner outlined above for structural floors.

Ornamental toppings with exposed aggregates for decorative and architectural purposes may be also had by using the proper kind and grade of CON-TEX on these toppings, as is explained in the section on SPECIAL CON-TEX. (See Page 19.)

Specifications for Bonding Con-Tex

IT is best to always specify BONDING CON-TEX by name. The following form is commonly used.

"All concrete surfaces indicated on the plans to be surface finished for bond shall obtain this bonding surface by the use of BONDING CON-TEX as made and supplied by the Concrete Surface Corporation, 342 Madison Ave., New York City.

"The BONDING CON-TEX shall be used and applied and the concrete shall be treated in strict accordance with the manufacturer's directions.

In public work where trade names are not permissible, the following form is commonly used:

"All concrete surfaces designated on the plans, or in the Specifications, or otherwise indicated to be bond-surfaced, shall be surface finished for bond by the use of a liquid material painted on the forms before placing concrete or on the concrete itself to obtain a revealed aggregate surface. The material used to produce this surface finish for bond shall be an approved liquid coating applied to the forms, or in top surface work, applied to the concrete before it has set and this approved coating shall meet the following requirements; it shall be composed of a colloidal base carrying active materials which latter shall operate only after coming in contact with the alkaline fluids of the concrete. This coating shall not contain free acid; shall not contain any ingredient that will injure the aggregate, the reinforcement or the forms; shall dry quickly, and after drying shall not be injured by rain, snow or freezing; and there shall be no after effects injurious to the concrete or to applied materials. All surfaces or forms for surfaces specified to be of concrete surfaced for bond by exposing aggregates, shall be given an even coat or coats of this liquid, taking care to completely cover all areas.

"Where such coating is applied to forms, after removal of forms the loosened surface of the concrete shall be immediately removed with wire brushes or other effective and approved means, and the concrete then thoroughly washed with hose or scrubbed with bristle brushes.

"Where such coating is applied directly to concrete, the surfaces treated shall be thoroughly cleaned of the coating and of loosened material at about 24 hours after applying, so that clean aggregates shall be evenly exposed throughout the areas treated."

Stucco Con-Tex for color and permanence in stuccos

(See back cover)

STUCCO has endless applications already realized.

Many other applications were never realized before the advent of STUCCO CON-TEX.

STUCCO CON-TEX gives texture to stuccos and it further enables permanent color effects, by reason of doing away with the slight surface film of cement and revealing the color values of the aggregates.

STUCCO CON-TEX further prevents cracking and crazing of stuccos, for most of such defects originate in the rich surface skin. By preventing the formation of this surface skin through the CON-TEX action, these defects do not occur. (See Discussion Page 22.)

Stucco Con-Tex

STUCCO CON-TEX is a light bodied CON-TEX adapted to be applied to mortars or to stuccos or to like materials either by means of a soft brush, or, if desired, by a spraying atomizer, either hand or power.

The time of application of STUCCO CON-TEX should be before the final set of the stucco and as near after the initial set as is possible.

STUCCO CON-TEX is applied *directly to the stucco*, after finishing. The evenness of application is easily judged by the temporary color of the CON-TEX. Twenty-four hours later, or thereabouts, the surface is brushed down and is then a finished permanent surface.

The value of Stucco Con-Tex

With STUCCO CON-TEX to reveal color, to give texture and to prevent crazing and cracking, Portland Cement Stucco becomes more than a crude "mud" to be used as a cover for lath, in imitation of the ways of those prehistoric men who daubed clay over reeds and rushes to make their elemental houses.

Stucco with STUCCO CON-TEX becomes a plastic mosaic.

There is no lack of artisanry in the world today. The skill of present-day workers has probably never been surpassed. There is no lack of beauty in the materials available to them; and for utility, there never has been a

material that compared with Portland Cement, whether gray or white Portland.

Yet, all the beauty of crushed marbles, of rich pebbles and of the garnet and golden sands has heretofore been made useless by the persistence of the cement cover; and this covering film is not only a concealer of beauty, but by its own nature destroys the stucco itself on exposure to the elements. (See discussion Page 22).

STUCCO CON-TEX does the very simple thing of preventing the formation of this surface film. And by this simple act, it unlocks a vast treasure house of construction possibilities not dreamed of before the advent of CON-TEX.

It is not exaggeration to say that any stone known or any construction in stone, or any construction in any other construction medium, may be equalled and even bettered in Portland Cement with the use of CON-TEX and at a saving in cost. Nor is the result an imitation. It is concrete—a new-found material, possessing its own beauties and character.

Stucco Con-Tex over cast concrete

We recommend that where buildings are to be surfaced, and particularly where the stone used in the body of the concrete is not sufficiently excellent, either in character, or in color, or in form, or in uniformity, to form an acceptable surface of itself, that BONDING CON-TEX to be used on the vertical surfaces to give bond and that on this bond surface be applied a stucco of selected materials, and preferably with white cement for contrast, and that this stucco be treated with STUCCO CON-TEX.

In this manner, texture of any kind is readily obtained with all the niceties of hand work but without the usual expense. The color of the stone used in the stucco is also made evident and any desired shade or shades may be very readily obtained by a proper combination of aggregates.

There is no limit to the applications of such "composite construction"—that is, the use of STANDARD CON-TEX or BONDING CON-TEX to obtain a bond on a rough concrete; and the use of SPRAYING CON-TEX to treat the stucco for a finished surface. (See section on Composite Construction, Page 16.)

Specifications for Stucco Con-TEX

IT is best to always specify STUCCO CON-TEX by name. The following form is commonly used:

"All Stucco surfaces indicated on the plans to be surface finished shall obtain this surface by the use of STUCCO CON-TEX as made and supplied by the Concrete Surface Corporation, 342 Madison Ave., New York City.

"The STUCCO CON-TEX shall be used and the stucco shall be treated in strict accordance with the manufacturer's directions.

In public work, where trade names are not permissible, the following form is commonly used:

"All stucco surfaces shall be surface finished by the use of a liquid material painted or sprayed on the stucco itself to obtain a revealed aggregate surface. The material used to produce this surface finish shall be an approved liquid applied to the stucco before it has set and this approved coating shall meet the following requirements: It shall be composed of a colloidal base carrying active materials which latter shall operate only after coming in contact with the alkaline fluids of the stucco. This coating liquid shall not contain free acid; shall not contain any ingredient that will injure the aggregate; shall dry quickly, and after drying shall not be injured by rain, snow or freezing; and there shall be no after effects injurious to the stucco. All surfaces specified to be of textured stucco by exposing aggregates, shall be given an even coat or coats of this liquid, taking care to completely cover all areas.

"Where such approved coating is applied to stucco, the surfaces treated shall be thoroughly cleaned of the coating and of loosened material at about 24 hours after applying, so that clean aggregates shall be evenly exposed throughout the areas treated."

Composite construction with Con-Tex for fine surface and artistic work

COMPOSITE Construction makes possible economical all-concrete constructions with finishes of the highest type and in the widest variety.

Composite Construction consists in:

- (1) Exposing aggregates on the surfaces structural concrete *for bond only* by means of BONDING CON-TEX.
- and
- (2) Applying on this bond-surface a stucco coat of selected aggregates and exposing these for color and texture by means of STUCCO CON-TEX.

New possibilities with composite construction

This type of construction is cheap and effective and is always satisfactory. The stucco never cracks or comes loose. By CON-TEX bond it becomes an integral part of the cast concrete. And the finish selected may be applied as a plastic mosaic with as great an exactitude and variety in color and in line as may be desired. Any artisan of skill can thus produce effects heretofore impossible technically and beyond reach in cost.

Examples of uses for Composite Construction are:

- Facades of buildings
- Columns
- Basements above grade for all classes of buildings
- Ornamental structures in parks and gardens
- And all structures of like character where visual inspection is at close range and an ultra-uniform texture is desired.

Advantages of composite construction

Composite Construction offers a finish of the highest grade and of any selected color of aggregates and cement with no construction niceties or care except in the final finish coat.

In many localities also, it is impossible to obtain stone of a good color such as would be suited to finished surface exposure, as with STANDARD CON-TEX, although its strength and its endurance are beyond question.

If, however, BONDING CON-TEX is put on the

forms, the structural portion of any structure may be cast in an exceedingly economical manner and with the use of an off-color stone, as the stone is exposed for bond only.

But with this bond surface obtained by BONDING CON-TEX, when the rough work has been done, the structural shell may be covered with a hand applied stucco of selected materials; and these materials are exposed by STUCCO CON-TEX.

Such a stucco coat is non-cracking and non-peeling, will not form hair cracks, and will not deteriorate with time; and will have all the sparkling color and beauty of the selected aggregates used in the stucco, unobscured by any cement skin or other disfigurement.

The final result is an exceedingly handsome structure which may be depended upon to have the fullest endurance. A minimum cost is assured by reason of the cheapest material being used in the structural shell and expensive materials, such as stone chips of one color or another, or of blended colors, and with or without white cement, used only on the thin finished coat.

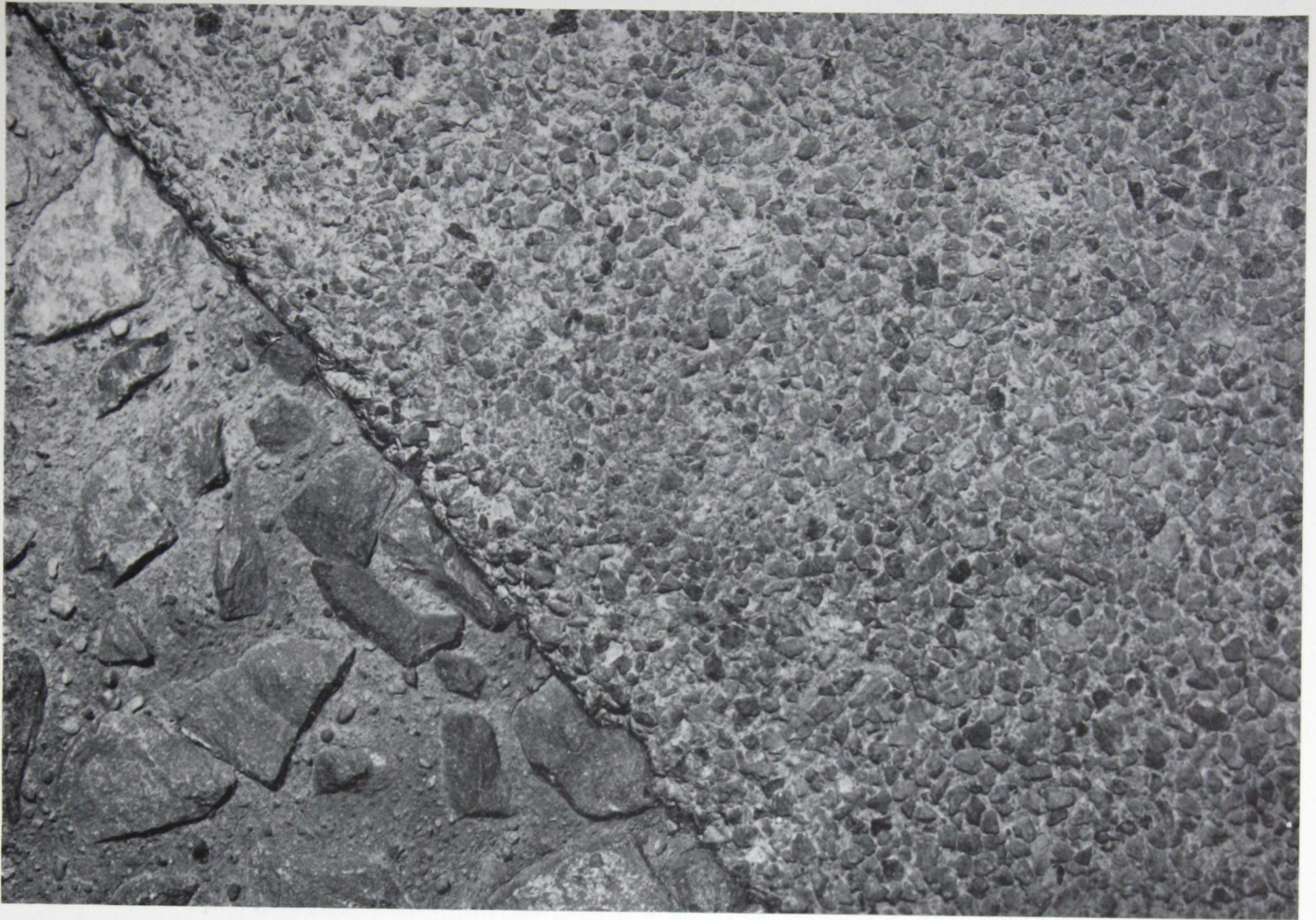
And STUCCO CON-TEX will not only prevent hair cracking of this stucco, but will also reveal full color values of the aggregate placed therein; and this color will never fade as do so many pigment colors used in the past in an attempt to equal Nature.

Composite construction for columns, pergolas, etc.

The economical construction of columns has always been a problem. Composite construction, as above described, lends itself to massive columns or to small columns with exceeding facility.

It is obvious that if a proper bonding surface on the coarse, load-bearing concrete is furnished, that a stucco outer coat of materials selected for color and for texture, may be put on by any skilled plastering mason with full assurance that it will adhere and adhere permanently.

If, then, this applied finishing material is surfaced with STUCCO CON-TEX a result of any degree of delicacy or beauty is readily had and with full assurance of permanence.



When the local aggregate lacks pleasing texture or color, delightful effects may be obtained by removing the structural form surface for bond. Stucco with selected aggregate is then applied and the surface treated with Stucco Con-Tex. The result is a live, brilliant finish at small expense that compares well with any architectural material.

Composite construction in other classes of structures

With the above outlined method it is obvious that there is no limit to the use and applications of concrete with CON-TEX.

In brief, any stone suitable for concrete may be used in the structural shell and exposed for Bond by BONDING CON-TEX. The finish coat material may be of any degree of excellence desired, and by the use of pigments and the use of colored aggregates, together with STUCCO CON-TEX a bewildering variety of beauty lies ready for use by anyone with ordinary skill in the concrete art.

We strongly recommend Composite Construction where aggregates are not of a color suited to the effect desired, or wherever there may be a doubt as to the skill or adequacy of the concrete contractor who obtains the work, as, per-

haps, on low bid under a Public Specification. Full control is assured by adopting Composite Construction for such uses.

In fact, to all difficult situations, Composite Construction with CON-TEX offers an effective, a cheap, and a satisfactory way out with assurance of an unsurpassed result, so long as the materials in the finished coat are chosen with taste as to size and color.

We strongly recommend in finish-coat work, that the maximum size of aggregates used be not over $\frac{1}{4}$ "; that the color of the aggregates chosen is determined on a sample as being satisfactory with the color of set cement; and that as much aggregate as the mortar will carry be used, as the beauty of the concrete really resides in the stone. Cement and sand merely furnish contrast, but the contrasting colors of all must be so chosen as to produce the effect desired.

Specifications for composite construction

ALL parts of the structure or structures designed on the plans or in the Specifications, or otherwise, as being "Composite Construction" shall be prepared as follows:

"BONDING CON-TEX shall be painted on the forms for all designated portions before the structural concrete is cast. When these forms are removed, these surfaces shall be brushed down or washed down to expose the stone fully and cleanly, ready to bond with the finish-coat, when it is applied.

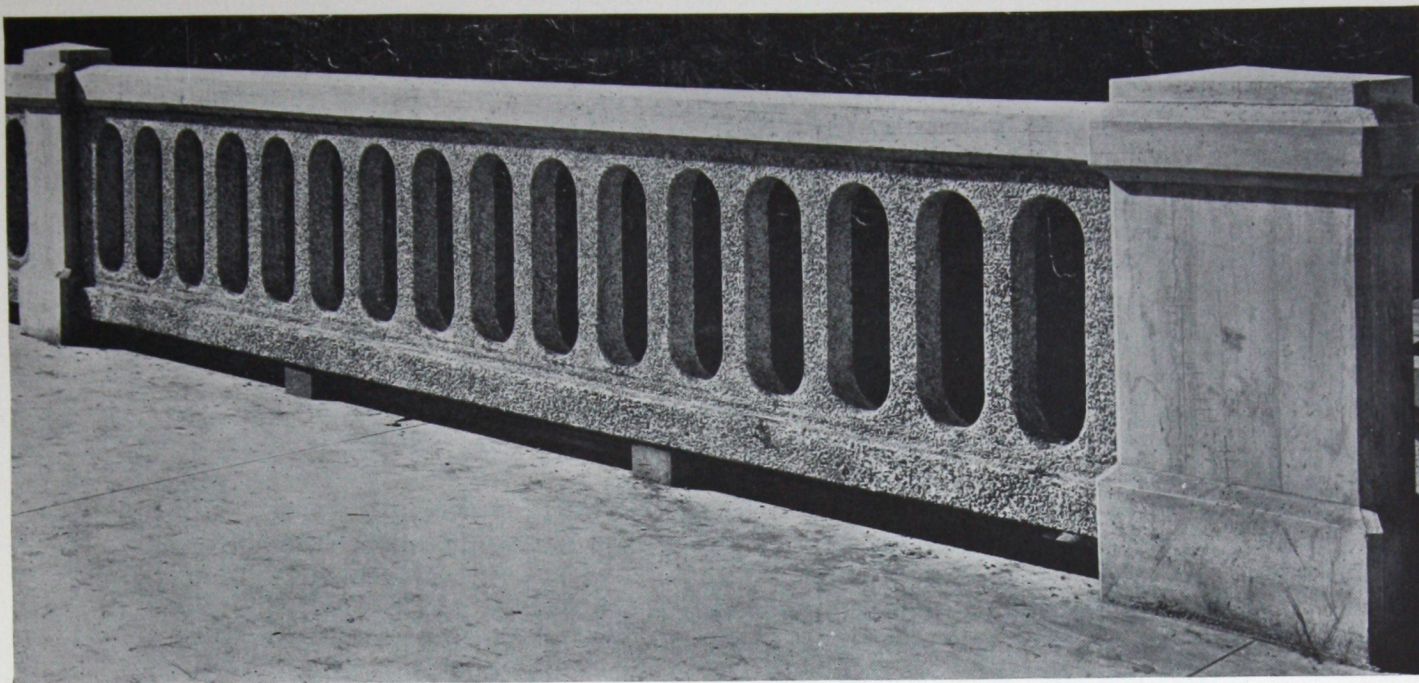
"The finish-coat shall be of white portland cement (gray portland cement) and sand and crushed stone, or screened gravel of uniform size, in the proportions of one part of cement—1½ parts of sand and as much of the crushed stone or screened gravel as the mixture will carry permissible with good application and troweling.

"This mortar shall be applied to the surfaces of the structural shell which have been bond-surfaced by BONDING CON-TEX; and they shall be run true to line, form and grade as shown on the plans or as directed by the Architect or Engineer.

"Shortly after this applied material has taken its initial set and before it has taken a full final set, it shall be lightly brushed over with STUCCO CON-TEX. This STUCCO CON-TEX should be applied in an even coat and to an even color to produce the reveal desired. The brush used shall be a soft brush which shall not mar the finished surface of the applied finishing material. STUCCO CON-TEX may also be applied by a hand or by a power atomizing spray, if this is preferred.

"At about 24 hours after applying the finish Stucco or when the applied Stucco coat or coats are thoroughly set, the surface shall be brushed over with a fine wire brush or with a scrubbing brush and water, or washed off with a hose, but in any case an even and uniform reveal of the stucco aggregates shall be obtained, both by the uniformity of the application of the STUCCO CON-TEX and also by the care exercised in brushing or washing off.

"When this washing off operation has been completed, these surfaces are completely finished and shall be protected as may be directed against scarring or marring or spalling; and if such spalling or marring occurs these scars or spalls shall be patched up with the same material used in the applied stucco coat and shall be brushed out to a uniform reveal so that the entire appearance when set and hardened shall be uniform and homogeneous and without streaks or patches or other disfigurements or variations."



Combining smooth-surface concrete with a Con-Texed surface gives variety and contrast to the railing on the St. Mary's Street Bridge, San Antonio, Texas. The Terrell Bartlett Engineers, Inc., Designers; McKenzie Construction Company, Builders.

Special Con-Tex

THERE are many special uses to which concrete with CON-TEX is suited, although the standard, or routine-work kinds of CON-TEX might not give the type of surface desired.

For instance, it is often desired to have special surfaces on roadways, on pavements, on floors, and like uses. To these, Special CON-TEX lends itself admirably; and if users desiring such special finishes will take up their problems with us, stating exactly what their problem is, and what materials or colors or combinations of colors they have available or desire to use, we should be very glad to give them the benefit of our experience in an advisory way.

We will also make up special CON-TEX which will suit their need.

Among these special CON-TEXES may be mentioned CON-TEXES which merely prevent cracking, crazing, dusting, and so on, without giving any reveal. This is often desired in such uses as interior floors, or in roadways and like constructions.

The beneficial effect of Special CON-TEX in these uses is such that a perfect preservation of the concrete may be had by merely preventing those actions which so often result in its destruction. It is not necessary to reveal the aggregate in this use of CON-TEX, inasmuch as a smooth surface may be maintained.

Still other varieties of Special CON-TEX are used for fine-surface wall and ceiling work, copings, columns and other special work in great variety.

It is impossible to list these within the compass of this brochure, but we shall be pleased to advise with those desiring special products and finishes.

The requirements of any given construction problem should be stated fully so that we may be in position to give the proper advice and recommendation.

The following precautions should be observed in finished surface work with standard Con-Text, but are not so essential in bonding surface work, or on composite construction

1. Whenever possible select aggregates of a color that will contrast with the color of set and hardened cement mortar.

Quartz and silica gravel usually contrast well with mortar. Lime stone, trap rock, grey sand stone and aggregates of like character do not always contrast well but an agreeable contrast can be easily secured by incorporating a proper amount of color in the mortar.

Additional contrast may also be had by proper panellings or proper combinations of CON-TEX work and plain finish work as described on page 10 of this circular.

2. In the usual type of concrete mix, one sized stone or gravel is to be preferred to graded or varied size ballast.

One sized stone or gravel does not segregate. Graded or varying sized ballast always tends to segregate in forms thus producing an uneven appearance. It is difficult in most commercial operations to secure a truly one sized ballast, but if an effort is made to approximate as closely as possible to one size, the result will be more fortunate than where a varied size aggregate is used. In using crushed stone as ballast, do not use large stone. Gravel has a "ball-bearing" value that enables easy placement, but large crushed stone tends to bridge in forms, thus leaving open sinkages below each bridging.

3. To overcome the tendency of ballast to sink and to segregate in concrete and also to make concrete more free working and to give better all-around results, we recommend the use of CON-TEX MIX STABILIZER in the mix.

A pamphlet descriptive of CON-TEX MIX STABILIZER, its properties and values, may be had upon request.

4. The smallest sizes of stone in a mix tend to accumulate at the form face. This means that the size of the ballast desired to show on the face should be chosen as the minimum size in the mix. This size is determined by the texture desired.

CON-TEX MIX STABILIZER mentioned above, tends to smooth out and to lessen this characteristic so that where a somewhat non-uniform texture is desired it may be had by the use of the MIX STABILIZER with varied-size ballast.

5. Use stone from a single source, sand from a single source, and cement from a single source throughout a job in order that the color of the concrete may be uniform.

6. Do not permit reinforcing steel to be leaned against the forms.

The usual practice in this respect of leaning steel against the forms and prying it back during placing until a little film of cement gravy covers it, has caused much trouble, as steel soon rusts and spoils the concrete. Temperature steel should always be in the middle of the form and other steel at least an inch from the form faces and firmly held in position.

Specifications for concrete

FROM long experience with field conditions we have learned how to cut out guess-work in the making of concrete.

Contractors have to be guided by specifications. To the end that the best results may be secured, the following provisions should be written into specifications and any provisions conflicting with these be omitted:

1. The mix shall be proportioned on the basis of 1:2 mortar and as much stone shall be added as the mix will carry. The exact proportion shall be determined on the job by trial with the materials to be used.

2. Accurate measurements of sand and stone shall be used throughout.

Weight proportioning with proper apparatus is recommended as there is no method which excels it in accuracy and no other method puts the right quantity of stone into the mix batch by batch.

Weight proportioning apparatus having high lever arms as in a standard scale is not as satisfactory as apparatus having proper lever ratios.

3. A full plastic consistency shall be used in all concrete. Sloppy mixes and dry mixes shall not be permitted.

4. All concrete shall be deposited through canvas tubes, or other effective means shall be used to prevent coating of steel and form sides with splash.

Splash builds up heavy layers of neat cement on form sides and on the steel. On the form sides these layers keep stone away from the surface. On steel they build a covering around the steel which dries rapidly and has no cementing value, so that bond is deteriorated. Depositing through a canvas tube about 10 inches in diameter is easy and convenient and materially improves the quality of any concrete work, since large quantities of cement are not used up in coating forms, but are kept in the mix, where they belong.

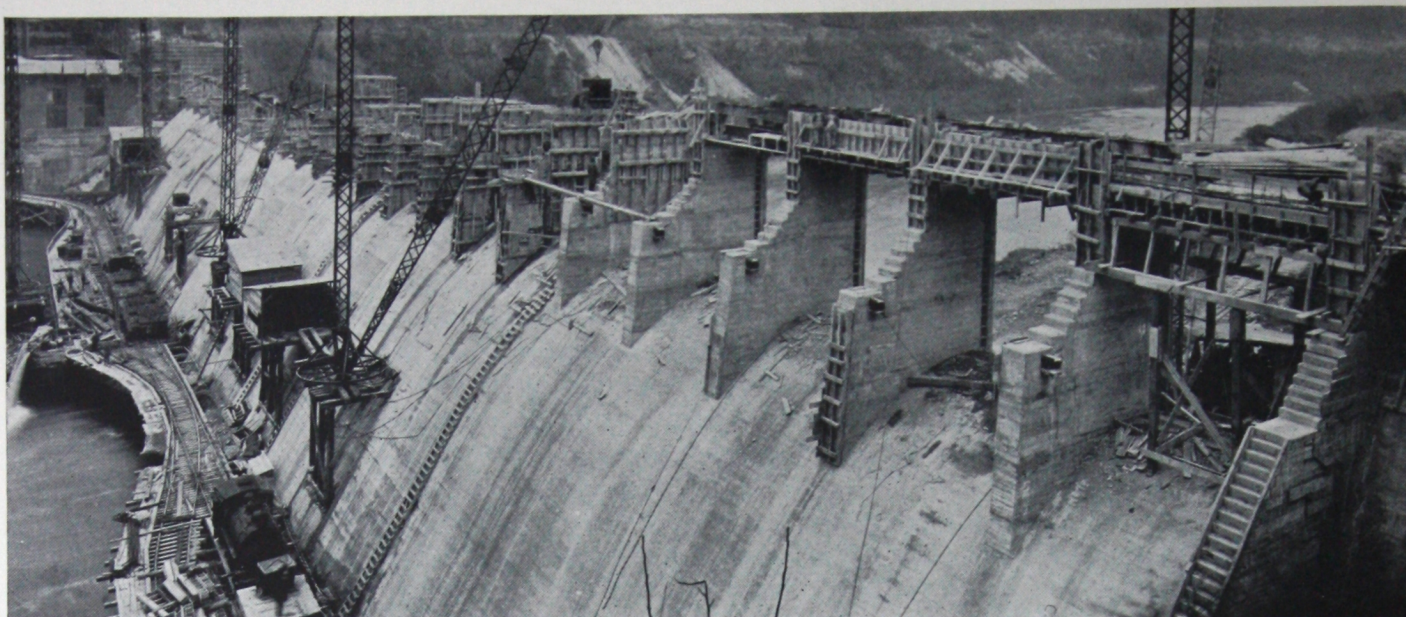
5. Forms shall be divided by bulkheads into sections convenient to pour to a full height in one continuous operation. The location of these sections shall be arranged in conference between the contractor and the Architect or Engineer and shall be rigidly adhered to. Bulkheads shall be CON-TEXED to secure true bonding between the section poured and the sections later poured. After removal of the bulkheads, these surfaces shall be cleaned of all loose material so that clean stone is exposed for bonding with the next pouring of concrete.

6. All pour lines and all pouring shall be kept even and horizontal.

7. All concrete shall be continuously puddled during placement three or four inches away from the Con-Texed form face in order to bring stone to the surface and to preserve an even mixture in the mass.

Spading away from form sides shall not be permitted as this unbalances the mix and puts too much cement at the form surfaces.

8. At the top of each pouring plane or stoppage point dry stone shall be added until the lift is choked with stone, and this shall be thoroughly puddled into the fine material that rises to the top. (There is always a rise of fine material on all concrete. Nature has decreed that stone shall sink. This means that fine material consisting of sand with an ample quantity of cement, rises to the top. To keep the mix uniform, extra stone must be added and puddled in.)



Where water-tight bond between hardened and fresh concrete is desired, Con-Tex treatment on the bulkhead form meets every requirement. Sanderson & Porter, Engineers and Constructors, used Con-Tex in this manner on the Cheat-Haven Dam of the West Virginia Power & Transmission Company. Con-Tex was also used to give a pleasing exterior surface to the power house coping.

Concrete and its characteristics in commercial work

By NATHAN C. JOHNSON, Hool and Johnson, Engineers

CONCRETE is so large a factor in the conveniences of our daily life that it may properly be termed an indispensable to modern civilization.

Everybody has seen concrete, either in the making, or in use as a finished structure. Everybody knows that it is made from Portland Cement and sand, and stone and water; that these are mixed together; and that while the mass is plastic, it is deposited in boxes or "forms," which carry steel rods known as "reinforcing."

Everybody knows that in a relatively short space of time this familiar semi-fluid mixture will set and harden to a rock-like mass which has great strength and great fire resistance.

But, unfortunately, when the forms are removed, this same concrete is found to have little of attractive appearance, for the grain and imperfections of the boards that make up the forms are faithfully reproduced and stubbornly held by the hardened mass. To disguise these appearances, a wash of cement or some plaster is put over the outside. For a time, the appearance may be very acceptable and everybody is happy.

Everybody knows, however, that after a relatively short time these surfaces stain and blotch and disfigure. Often the surface coating peels off in patches of greater or less size and perhaps in unpredictable localities. Because of these

things, many a structure that was fine in appearance when first completed has ceased to be an ornament to its locality or a monument to its builders. And then nobody is happy.

Unfortunately also, many of the structures built of concrete have troubles other than these difficulties of appearance. These additional troubles are more serious. Leakage of water through concrete is common, particularly at joints. Disintegrations of serious extent begin at or near these joints and spread over considerable areas.

From common observance and recognition of these things has come a widespread public demand for "better concrete." Buyers, in particular, want better concrete and assurance that their investment will not depreciate.

How to produce this better concrete is one of the most important problems that confronts the engineering world today. It may not be dismissed with a wave of the hand but must be solved, and in a practical manner that will meet all tests.

The nature of the problem

Fortunately, by the use of proper means, it is now easy to make concrete on a commercial scale which will uniformly possess all characteristics which are needed to fit it to serve in any

capacity and in any exposure and without disfigurement or deterioration.

To learn how this may be done, there is no field of study so profitable as observance of structures which have not fully stood up and of the common or "practical" procedures still adhered to, which brought these structures into being.

First of all, it is to be noted that the time-honored, "good old ways" which may be seen on every hand, result in portions of a structure being good and portions poor, but rarely wholly bad. It is further to be noted that good or bad, *the structure always bears its load*. In other words, current procedures produce an uncertain and unpredictable result as to character of concrete; but *the strength of even the poorest portions* is always sufficient for the purpose at hand, so far as strength alone is concerned.

And it is further to be noted that the surface of the best and of the poorest is alike in its general characteristics of staining; and that applied surfacings over one and over another are about equal in their ability to come off and to blotch and otherwise disfigure after a short period of time.

In fruitful endeavors to find out why these things are as they are, laboratories have been laboring with strength tests for years; and from these tests have evolved "laws" which, if they are correct, should overcome all difficulties, provided that such strength tests cover all requirements to which an actual structure is subjected and that these laws, or rules, may be economically put into practice in the field in commercial work.

The nature of concrete in field and in laboratory

But since certain structures in every community are as they are, it is worth while to examine the nature of commercial practices and of laboratory practices as well, to see if there may not be needed a reconciliation of one with another which will be to the benefit of the industry.

What is concrete?

According to standard definition, it is "An intimate and homogeneous mixture of stone, sand, Portland cement and water in definite proportions."

That is, it *should be* an intimate and homogeneous mixture of materials, three of which, at least, have different natures, different specific gravities and different behaviours. And this mixture, in commercial work, is not ounces or

pounds or teaspoons of the several substances, but is tons and hundreds of tons per plant per day.

Obviously, if it is not "an intimate and homogeneous mixture * * * * in the specified proportions" it is not, according to definition, concrete and perhaps should not be paid for. In the laboratory, on the other hand, pounds and ounces are under control, and there is no issue either of service, or of payment.

Furthermore, the laboratory test specimen is so small that it is easily manipulated, while the field section is difficult to manipulate.

Laboratory conditions, then, are one thing and field conditions are another.

Nature of field practices in making concrete

On the job, concrete is made in a one-machine factory. This one machine is a little barrel or a big barrel with paddles in it which mix from half a ton to four tons of materials together in jig-time. But as four-ton batches are rare, smaller jobs using one or two bag mixers that have an easier task, may more fairly be studied as representing the art as it is and as it affects the great bulk of the annual output of concrete.

On these jobs, wheelbarrows are used as measures of the "specified proportions." Laborers load them, laborers push them; and when the mixer has run its allotted minute of time "after all materials are in the drum," laborers push other barrows, or concrete buggies to the forms and with a grand swoosh, get rid of their load.

What happens while this stuff is tumbling down into the forms is a whole story in itself—a story too long to tell in this brief summary. But among the things that happen is a separation of coarse materials from fine materials that does not argue well for the "homogeneous" character of the mass. The old plea of "averaging in the forms" is a comfortable pillow, but reliance on it is a poor guarantee to a customer who is buying concrete.

But in any event, the forms are stripped after this "intimate and homogeneous" filling has set and hardened. Then the work goes higher, assuming that the structure is of more than one lift. And again these processes are repeated.

No matter, then, how technically learned the heads of any contracting organization may be, or how able the designer, or how conscientious the superintendent, or how eminent the consulting engineer, the laborer is superior to them all,

for he it is who has first and last say as to what is produced and he and his fellows are the ones who cause the best-laid plans to go straight or to go awry in the final result.

Labor costs superior to field work

This outline is true in detail and in implication on the majority of concrete jobs throughout the United States and regardless of whether the contractor is little Joe Whichovitch with his wheelbarrow or the Kolossal Builders with towers and chutes and cranes.

For Old Man Costs is the generalissimo. Costs are always dominant, and within reason, rightly so. In apparent justification of a continuance of procedures as they are, it has time and again been shown by laboratory tests of cylinders of concrete taken from the mixture as thus made and poured that the strength of *these cylinders* was satisfactory; and it has been repeatedly stated, although post mortems may later have become necessary, that because of the findings of these tests, the structure was "perfect concrete."

This leap of reasoning is too broad to be logical, in view of other undeniable facts in the case. The lapse should be found and evaluated.

This lapse seems to be that when the laboratory test specimens are made, standard procedures require that they shall be so puddled, so manipulated and so treated that they do become "an intimate and homogeneous mixture," but in the forms, there is no puddling and no care beyond "spading back from the forms." This latter, while it produces an extra-heavy layer of cement at the surface, takes away cement from the mixture by this very process and aggravates a condition that is already bad—namely, lack of uniformity.

The uniformity of field concrete

Lack of uniformity in field concrete—although uniformity is the vital essence of strength and therefore the very foundation of design—is constantly promoted by a simple law of Nature. This law is the Law of Gravitation. Stone always sinks in a concrete mass and to such a degree that *no matter what proportions are started with in a semi-fluid, the final proportions tend to approximate 1:2:5½.*

And above this settled and compacted mass a fine material—laitance, muck, slack—or whatever name is chosen. By core borings and other data it has been repeatedly determined that this rise is approximately 12½% of the height of any lift.

This material is not concrete. It has little strength and no water resistance. Yet hundreds of thousands of yards of it are paid for annually as concrete.

Do not blame the laborer for this condition. He is unaware of its existence. And do not blame the engineer, or the superintendent, or the foreman. They, likewise, have been unaware of the prevalence of these things and of their importance.

But this condition should be corrected, for where this muck is, there disintegration starts. The verdict of nearly all post mortems is "excess water, improper mixing, improper placing." It is a great tribute, however, to the natural abilities of Portland cement that in those portions between muck layers, the concrete is permanent and unaffected, in spite of its abuse during "improper mixing" and "improper placing."

Securing uniformity in field concrete

As a remedy for these conditions, it has been widely proposed to cut down the amount of water.

But when this is done beyond a certain amount, placement is difficult. And difficult placement means higher costs; and our old friend and master, the laborer, has this borne in upon him most forcibly by his superiors as regards output-per-day and also by the protests of his own muscular system.

Nor even if costs are disregarded does this proposed remedy prove wholly effective. Dry concrete is usually honeycomb concrete, whether or not it has a skin over it, or whether it is skinned over later by hand. And honeycomb concrete is porous concrete; and porous concrete dissolves and softens and may disintegrate when water gets at it.

Yet, after all, the problem is simple; and laboratory and field are easily reconciled.

It is now recognized that distribution of cement throughout a mass and the maintenance of that distribution are as important factors as are the gradings of sand or stone. An equal and homogeneous distribution of sand and of stone in a mass are as important as the exact quantity of water used, provided that water does not, of itself, cause separation.

There is no present need to review in detail the many studies that bear on and lead to these conclusions. They are intricate in some phases and simple in others. They vary from the complex nature of the products formed in the hy-

dration of Portland cement and the electrical charges of ions, to the common-sense view that, as we are handling about five hundred billion particles in a single cubic yard of concrete, the usual chances of obtaining uniformity from yard to yard in the "good old way" are very remote.

But, on the other hand, *if the mix is properly stabilized*, so that the distribution of cement and of aggregates is maintained uniform, then costs come down, quality is improved and what amounts in effect to laboratory control is painlessly put into effect in the field, to the great benefit of the art.

The outer skin of concrete and its effect on concrete

But although by these measures and by reasonable care in placement (see specifications for Concrete—Page 21) the body-character of concrete is improved and made dependable, there still remains on the outside the unsightly form skin, which detracts from value.

If unsightliness were the sole objection to this form skin, it might not be objectionable. But unfortunately, its nature is even less beautiful, from the standpoint of values, than it looks.

The form skin of concrete, in fact, is a direct detriment to the permanence of concrete and the greatest present limitation on its fields of usefulness.

Even visual inspection of the surface of any concrete as it comes from the forms shows that the outer surface or skin is exceedingly rich in cement. When it is realized that the tremendous strength of concrete is derived from only $\frac{1}{4}$ part of its total bulk, i.e. Portland cement, it is evident that Portland cement is a source of tremendous energy; and it is known that this energy is released as soon as and whenever the cement comes into contact with water.

Since, then, the form skin is so rich in cement, it must be admitted that a tremendous amount of energy for either good or ill is concentrated at these skin surfaces, since the concentration of cement is so great at these surfaces. All that is needed is a continuing source of water, as from the moisture of the air, to produce a continuing series of actions of greater or less severity.

The outer skin of concrete and its actions

Energy must always find an outlet. The energy of Portland cement must have something to work upon. It is for this reason as

well as for the sake of cheapness and of bulk that sand and stone are introduced into concrete with Portland cement, for they serve as receptacles for the energy that is released from the Portland cement. If sand and stone are absent and pure cement occurs in a concrete, the energy liberated may be so intense as to cause destruction.

This is plain to be seen in every surface skin of concrete, if we do but look with seeing eyes.

An instance of such destruction is in top surfaces of floors, which dust and disintegrate for the reason that they have at their outer surface too great a concentration of energy in the form of Portland cement.

This is a top surface skin, but a form skin often behaves in the same way. The usual skin of concrete, therefore, may have certain characteristics which work against the permanence and value of a concrete.

With so much energy concentrated at this skin, cracking of the skin itself is common. Furthermore this skin is constantly undergoing changes by reason of absorbing moisture from the atmosphere or elsewhere and taking it into combination. This sets up a series of actions in or near the skin which often are different in nature and intensity from the body of the mass, so that deep penetration of cracks and the like with actual rupture of the concrete mass may take place. And through these ruptures, supplemental actions, such as frost, go further in and carry on destruction.

The surface skin of set concrete and bonding

Another characteristic of a skin containing great concentration of pure Portland cement is that *no applied material will effectively and permanently bond to it*.

Applied materials such as new concrete and mortars and stuccos and plaster and like substances, have been *said* to bond with set and hardened concrete but this is a phrase of courtesy only, as is attested by numberless structures which certify to the contrary.

The reason for this failure to bond is that the set and hardened Portland cement in the skin of concrete as it comes from the form, finds a manifestation in opposing and differing with the unleashed and uncontrolled energies of the new cement that is applied as a plaster or as a wash, thus bringing about a sort of family quarrel that divides the house against itself, with the usual and well known result that such a house cannot stand.

New values in concrete by preventing the surface skin

Yet "skin deep" are different and better values. Just below the form skin are sand and stone which possess unlimited abilities to bond with Portland cement and with the energy of Portland cement while this cement is in the plastic stage.

If, therefore, the usual concealing surface skin of concrete is removed,—or better, *if its formation is prevented*, the energy absorbing values of this hidden sand and stone become available for new and useful purposes.

It is well known that sand and stone have unlimited endurance on exposure to weather and to the elements. It is equally well known that Portland cement being of itself a perpetually active compound, even though it seems to be inactive, does not possess such endurance.

If, therefore, by removing the surface skin we can expose a high percentage of water-resisting sand and stone to the elements it is evident that a better wearing surface or weathering surface is obtained than can be had by any surface containing a large percentage of Portland cement.

As an instance, it is quite easy to expose 84% of a total surface area as stone or sand. This reduces the possible absorption of the remaining Portland cement to 16% in place of a possible absorption of 100% of the area.

It is therefore evident at once that the surface skin is not, and may not be, the protection and salvation of concrete which it was once assumed to be, but that on the contrary, it may be a restrictor of permanence and even an active destructor and that it is at least a menace to permanence in concrete.

Another advantageous characteristic of a revealed aggregate surface is that while the outer portions of such a surface are clean sand and clean stone, the inner portions are firmly bonded in the concrete mass.

This means that all the natural ability of sand and stone to bond with new and applied materials is ready to be of service, yet the embedment in the set concrete is not impaired in any manner by a controlled exposure of the surface.

Therefore, by means of such controlled exposure and doing away with the surface skin, the following additional values are conferred on concrete:

1. The appearance of concrete is greatly improved.
2. The permanence of concrete is improved by doing away with the usual surface cracking and scaling.
3. The abilities of concrete are extended by making possible a true bonding to concrete of new substances which is in effect a welding of a new section to a section which has been cast.
4. The waterproofness of concrete is improved by presenting the high percentage of highly resistant materials to surface attacks.
5. The absorption of concrete is lowered by reducing the area through which the absorption can possibly take place.
6. The usual destructive actions which take place in top surfaces, such as the surfaces of floors, roadways and the like, are prevented, even though no stone or sand be revealed, by a variation of the actions of the same process of preventing the injurious actions that take place when a surface skin is permitted to form.

Attaining character and permanence in concrete

To have a sound, enduring concrete, therefore, it is first of all necessary to have a rational yet commercial and economic procedure followed out in the field. To serve as a guide for such procedures the specifications for concrete which precede this section are included in this brochure.

These specifications, if followed, insure a sound body. But to realize the full values of this sound body, it is further necessary to be rid of the surface skin, or form skin and of the limitations on life and integrity and on appearance which its continued presence imposes.

With these two things accomplished there is then no perceptible limit to the usefulness and the applications of concrete in the structural and architectural fields.

What users say about Con-Tex

From Dwight P. Robinson & Company, New York:

"In the summer of 1925 we used CON-TEX for surface finish on the concrete work at the New Larchmont Gardens Station Improvements of the New Westchester and Boston Railroad.

"The results obtained are pleasing to us and to our clients. The surfaces produced by CON-TEX are better than could be had by tooling the concrete, and were obtained at a less cost."

From the National Concrete Company, Indianapolis:

"We are mailing you under separate cover photograph of the Mishawaka Avenue Bridge at Mishawaka, Indiana, which we recently completed. You will be interested in this structure because of the use of your CON-TEX in finishing.

"Our experience with CON-TEX has been very satisfactory. The cost of finishing with CON-TEX runs in general about fifty per cent. of the cost of bush hammering by hand, and gives a much more satisfactory appearance."

From The Terrell Bartlett Engineers, Inc., San Antonio:

"We have specified CON-TEX for securing a revealed aggregate finish on the railings of two bridges recently completed under our designs in this city for the City of San Antonio. These bridges are the new steel and concrete crossing of the San Antonio River on North Presa Street and the new reinforced concrete bridge on St. Mary's Street across the same stream, in the heart of the City. Our first acquaintance with and use of 'CON-TEX' was on the railings of the two bridges stated. We take pleasure in saying that the results secured were fully up to our highest expectation and we are very much pleased with the finish secured through the use of this preparation. We believe that this material, together with the pains taken with the work by the McKenzie Construction Company of this City, contractors for both structures, is responsible for securing bridge railings which are superior in appearance to any which have heretofore been built in San Antonio, and more pleasing than any that we have personally seen anywhere."

From Rosenthal Engineering & Contracting Co., New York:

"We want to take this occasion to express our faith in CON-TEX as manufactured by the Concrete Surface Corporation on a three-quarter million reinforced concrete job, a building we constructed for the New York State Architect in Brooklyn, New York, known as the New York State Arsenal.

"We used approximately eleven hundred (1100) gallons and we found that the material performed its function very properly and produced a surface satisfactory to the Architect and in every way superior to a hand tool surface.

"The material is applied very easily and economically and the washing off of the cement skin immediately after the removal of the forms is performed with ease.

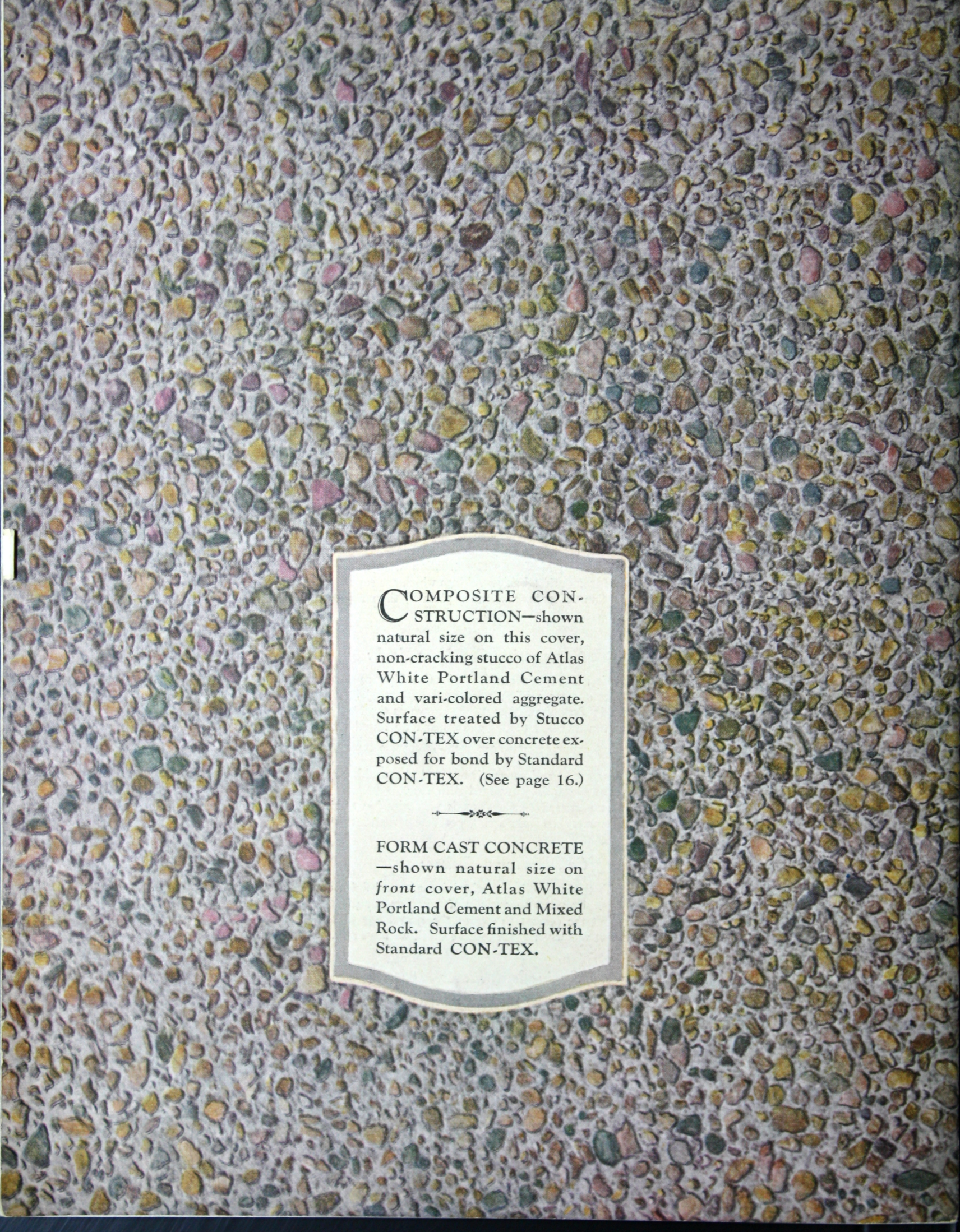
"We believe that the surface proposed of CON-TEX is very pleasing to the eye and should meet with great success throughout the country on reinforcing concrete structures."

From Humble Oil & Refining Co., Baytown, Texas:

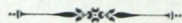
"We have been using CON-TEX successfully for obtaining a gravel finish on the face side of curbs and on the foundations of buildings. Previous to our use of CON-TEX our practice was to remove the forms as soon as possible and brush out the cement to expose the gravel aggregate. This was a difficult and expensive operation and the result was never equal to that which we have obtained by the use of CON-TEX."

From A. E. Stephens Company, Springfield, Mass:

"We are using CON-TEX to form a plaster bond, on concrete columns and ceilings. To date we have had no difficulty in using this material, and the results certainly look as though it has solved the age-old problem of forming a satisfactory surface for plaster bonding. We have not as yet applied any plaster and probably will not until warmer weather, but as it looks now there should be no trouble in getting a perfect bond."



COMPOSITE CON-
STRUCTION—shown
natural size on this cover,
non-cracking stucco of Atlas
White Portland Cement
and vari-colored aggregate.
Surface treated by Stucco
CON-TEX over concrete ex-
posed for bond by Standard
CON-TEX. (See page 16.)



FORM CAST CONCRETE
—shown natural size on
front cover, Atlas White
Portland Cement and Mixed
Rock. Surface finished with
Standard CON-TEX.